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14. ABSTRACT
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Predictors of Suicidal Ideation Across Deployment: A Prospective Study

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Objective: Concurrent and prospective predictors of suicidal ideation were examined in a sample of 318 United States Air Force Security Forces across a 1-year deployment in Iraq and 6- to 9-month follow-up. **Method:** Participants included 294 male and 24 female Airmen ranging in age from 18 to 46 years, predominantly (67%) Caucasian. Measures included self-reports of postdeployment suicidal ideation, posttraumatic stress and depressive symptoms, alcohol use, combat experiences, relationship distress, social support, and postdeployment readjustment. **Results:** Problem drinking before deployment prospectively predicted postdeployment suicidal ideation in univariate analyses. Depressive symptoms and problem drinking were significant independent predictors of postdeployment suicidal ideation. Findings demonstrated a ninefold increase in suicidal ideation among service members with even mild depressive symptoms if moderate problem drinking was also present. **Conclusions:** Predeployment problem drinking may serve as a modifiable target for early intervention of suicidal ideation. Findings illuminate the compound risk of comorbid depressive symptoms and moderate problem drinking in predicting suicidal ideation. © 2015 Wiley Periodicals, Inc. J. Clin. Psychol. 71:828–842, 2015.

Keywords: suicide; suicidal ideation; depression; PTSD; alcohol misuse

In the past decade the U.S. military has experienced what has been termed "an epidemic of suicide" among men and women in uniform (Kang & Bullman, 2009). The overall suicide rate for the Department of Defense (DoD) increased by about 50% from 2001 to 2008 (Ramchand, Acosta, Burns, Jaycox, & Pernin, 2011). For the past several years, more U.S. Soldiers have died from suicide than in combat (Hoge & Castro, 2012). Although suicides in the U.S. Army declined in 2013 after nearly a decade of steady annual increases, the rate of suicides among young veterans just out of the service and receiving health care from the government reached three times the rate of active duty troops (Kemp, 2014).

U.S. military and government leaders have initiated comprehensive examinations of the rapid rise in suicide in hopes of identifying evidence-based recommendations for reversing this trend (Department of the Army, 2010, 2012; DoD, 2010; Ramchand et al., 2011). One consensus across reports is that screening for empirically determined risk factors, particularly in primary

care settings, could provide opportunity for selective suicide prevention efforts. A challenge for the military is gaining a better understanding of the suicide risk factors most relevant to service members to warrant proactive intervention. It is often presumed that the military's increased suicide rate is a tragic consequence of the strain on service members and their families from waging the longest war in America's history. Multiple deployments, repeated exposure to a variety of war zone stressors, challenges of readjusting to life after deployment, increased work demands, and failed relationships have been related to a higher prevalence of mental disorders among service members (Hoge & Castro, 2012), all of which may directly or indirectly increase the risk for suicide.

Consistent findings across retrospective studies of suicide deaths are that service members who kill themselves are likely to be young (17 to 24 years of age) White males in the junior enlisted ranks who recently experienced the end of an intimate relationship. A history of outpatient or inpatient mental health treatment for mood disorder, especially depression, and substance abuse is more common among suicide than nonsuicide groups (Black, Gallaway, Bell, & Ritchie, 2011; Bush et al., 2013; Conner et al., 2012; Griffith, 2012). The Millenium Cohort Study (Smith et al., 2008) identified prospective predictors of 83 suicide deaths that occurred through 2008 in a cohort of current and former military personnel ($N = 151,560$; LeardMann et al., 2013). Male gender, depression, manic-depressive disorder, and alcohol-related problems were significant independent predictors of suicide death. Of note, measures of deployment (any combat experience, number of days deployed, total number of deployments) were not associated with suicide.

An alternative approach to studying suicide risk is to examine factors associated with nonfatal suicide behaviors, i.e., suicide attempts or suicidal ideation, due to their much greater prevalence and close association with risk for completed suicide (Nock et al., 2008). Periodic health surveys conducted by the DoD (Bray et al., 2010; Lane, Hourani, Bray, & Williams, 2012) found that the prevalence of suicidal ideation was higher among those who had been deployed to other operational theaters compared to those who had been deployed in support of Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF) or not deployed at all. Suicide attempts were more common among those who had not been deployed at all compared to those who had been deployed in support of OIF/OEF.

A growing number of studies have examined the relation between level of combat exposure (versus deployment per se) and suicide behaviors. Cumulative combat exposure, i.e., total count of past combat-related experiences, has been unrelated to suicidal ideation or attempts in cross-sectional studies (Bryan, McNaughton-Cassill, & Osman, 2013; Griffith, 2012; Nelson et al., 2011). Studies that have found a significant correlation between level of combat exposure and suicide behaviors report that the association becomes nonsignificant when controlling for current mental health symptoms (Gradus, Street, Suvak, & Resick, 2013; Pietrzak et al., 2010; Thoreson & Mehlum, 2008). However, several studies have found that service members who endorse certain combat experiences, e.g., witnessing atrocities (Sareen et al., 2007), killing another person (Fontana & Rosenheck, 1994; Maguen et al., 2012), have significantly higher rates of suicidal ideation, suggesting that the type of combat experience is more relevant to suicide risk assessment than a sum of all exposure.

Beyond combat exposure, others have reported the importance of psychosocial factors to the occurrence of suicidal ideation. Low levels of perceived social support (Bossarte et al., 2012; Pietrzak et al., 2010) and unit cohesion (Mitchell, Gallaway, Millikan, & Bell, 2012) and greater psychosocial difficulties (Pietrzak et al., 2010) have independently predicted suicidal ideation in cross-sectional surveys of OIF/OEF veterans. A recent study (Bryan & Hernandez, 2013) of active duty Airmen found that social support did not differentiate suicidal from nonsuicidal participants. Rather, level of social support appeared to influence the severity of suicidal ideation among those Airmen affected.

The purpose of the present study was to test the predictive validity of the most commonly identified factors associated with suicide behaviors among military members. These include individual factors (depression, posttraumatic stress disorder [PTSD], problem drinking, combat exposure) as well as psychosocial factors (relationship distress, low social support, postdeployment adjustment difficulties). The study used a prospective design comprising assessments

obtained at pre- and postdeployment in a sample of Air Force service members participating in a 1-year deployment to Iraq. The primary dependent variable was the occurrence of suicidal ideation after deployment. Our literature review supported a priori hypotheses that alcohol use and depression would positively predict the occurrence of suicidal ideation. Testing of the other potential predictor variables was considered exploratory. The results were intended to help inform decisions regarding which factors should receive the greatest emphasis in future selective suicide prevention efforts.

Method

Participants

Participants were active duty service members evaluated in a longitudinal investigation of U.S. Air Force Security Forces (refer to Cigrang et al., 2014). Two detachments of Airmen (combined $n = 318$ at predeployment) were tasked to train Iraqi police, a high-risk mission that required patrolling in communities with high insurgent presence; they deployed in two consecutive, 1-year deployment cycles during 2009 and 2010. Airmen completed study measures at predeployment and 6 to 9 months postdeployment. A total of 204 Airmen completed postdeployment measures and, of these, 164 could be matched to predeployment responses (see description of procedures, below). Participation was completely voluntary and study procedures were approved by the Wilford Hall Medical Center Institutional Review Board.

Airmen ranged in age from 18 to 46 years (mean $[M] = 25.0$, standard deviation $[SD] = 5.4$) and the large majority (92%) were male. A majority (67%) identified themselves as Caucasian, followed by 14% African American, 11% Hispanic, 5% Asian, and 1% Native American. Officers composed only a small percentage of the sample (4%). Overall, this sample of Security Forces was somewhat younger compared to the entire U.S. Air Force, with a higher percentage of enlisted, minority, and male participants. Most (78%) of the Airmen in this sample had deployed at least once previously, and 34% had two or more prior deployments. At predeployment, nearly half (48%) of participants reported being married or in a committed relationship lasting 6 months or longer.

Procedure

The research team met with the two detachments of Airmen at their predeployment training site 30 days before their deployment and informed them regarding the purpose of the study, the anonymity of their survey responses, and the voluntary nature of their participation. Approximately 98% of Airmen chose to participate. After their return from Iraq, these Airmen dispersed to their original bases or were moved to their base of preference at locations across the United States and other countries. At 6 to 9 months postdeployment, the Airmen were invited to return to Lackland Air Force Base to participate in focus group discussions and to complete additional study measures. Airmen who could not attend the follow–up conference were invited to respond via a web-based survey, and 35 participated via this method.

The start of each survey asked the participant to provide their mother's first and last initials (e.g., Ann Jones = AJ), the calendar date on which they were born, day only (e.g., born Apr 15 = 15), and their hair color from a list of options (black, brown, etc.). This information was used to create a unique identifier that was anonymous and could match participants' pre- and postdeployment surveys.

Of 204 Airmen participating in the follow-up, the research team was able to confidently match the responses of 164 Airmen (80%) to their pre- and postdeployment surveys. Occurrence of nonmatched Airmen resulted from participants omitting responses to the unique identifier questions. The 164 matched Airmen did not differ from the larger cohorts of 318 Airmen assessed before deployment or the 204 Airmen assessed postdeployment on any measure of demographic characteristics, intimate relationship functioning, or most measures of individual emotional or behavioral functioning ($ps > .14$). However, matched Airmen demonstrated significantly fewer symptoms for depression and problem drinking at predeployment ($p < .05$ and $p = .05$, respectively) compared to the larger cohort of 318 Airmen assessed before deployment.

Measures

Depression symptoms. Levels of depressive symptoms were assessed using the Patient Health Questionnaire (PHQ-9), a well-validated measure of depression comprising nine items corresponding to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnosis of major depression (Kroenke, Spitzer, & Williams, 2001). Airmen were asked to rate the frequency with which each symptom was experienced in the past two weeks, from 0 (*not at all*) to 3 (*nearly every day*); an example item is "Feeling down, depressed, or hopeless." Scores on the PHQ-9 $\geq$ 15 operationalized high or severe levels of depressive symptoms, whereas scores from 10–14 operationalized mild to moderate depression (Kroenke et al., 2001). The item assessing suicidal ideation was removed from the measure and used as the outcome variable of interest (described below). The resulting eight-item measure demonstrated good internal consistency at pre- and postdeployment (α = .72 and .88, respectively). The PHQ-8 and PHQ-9 have demonstrated similar sensitivity and specificity in a large sample of VA patients in a primary care setting (Corson, Gerrity, & Dobscha, 2004).

Problem drinking. The Alcohol Use Disorder Identification Test (AUDIT) is a well-established 10-item screening measure for alcohol abuse developed by the World Health Organization (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). For each item, respondents rate the frequency of occurrence on a 5-point scale (ranging from 0 to 4); an example item is "How often do you have six or more drinks on one occasion?" Based on both the overall score and the pattern of responses respondents are classified into one of three risk categories: scores between 0–7 are operationalized as "low-risk," 8–15 as "risky," and 16 or higher as "high risk" (Babor et al., 2001). At pre- and postdeployment, α = .83 and .84, respectively.

PTSD symptoms. The PTSD Checklist–Military version (PCL-M; Weathers et al., 1993) is a 17-item measure corresponding to the DSM-IV diagnostic criteria for PTSD. For each item, respondents rate how much they have been "bothered by the problem in the past month" on a 5-point rating scale ranging from 1 (*not at all*) to 5 (*extremely*), with scores ranging from 17–85; an example item is "Repeated, disturbing memories, thoughts, or images of a stressful military experience." The most conservative diagnostic cutoff recommended for the PCL-M is a total score of $\geq$50, although lower cutoffs ranging from 32–49 have been suggested based on the population or context in which the measure is used (Bliese et al., 2008). In the present study, scores on the PCL-M $\geq$50 were considered high or severe levels of PTSD symptoms (Weathers et al., 1993), whereas scores from 32–49 were considered indicative of mild to moderate levels (Bliese et al., 2008). At pre- and postdeployment, α = .87 and .95, respectively.

Combat experiences. A 22-item measure was used to assess combat exposure during deployment. Items were adapted from the Peacekeeping Experiences Scale described by Adler, Dolan, and Castro (2000). Service members indicated whether or not they had experienced a combat-related event (e.g., "being shot at" or "seeing dead or seriously injured Americans"). The number of stressful events experienced served as the measure of interest, with scores ranging from 0–22. Combat experiences were measured at postdeployment, α = .87.

Intimate relationship health. The Marital Satisfaction Inventory–Brief form (MSI-B) is a 10-item screening measure designed to identify intimate relationship distress (Whisman, Snyder, & Beach, 2009). Item content reflects global distress and conflict in specific domains of affective and problem-solving communication, sexual interaction, and leisure time together. Scores range from 0–10, and an empirically established cut score of $\geq$4 is used for discriminating distressed from nondistressed couples (Whisman et al., 2009). The MSI-B was administered at pre- and postdeployment, α = .88 and .91, respectively.

Social support. The Multidimensional Scale of Perceived Social Support (MSPSS) is a 12-item measure designed to capture the perceived adequacy of social support (Zimet, Dahlem, Zimet, & Farley, 1988) across three sources including family, friends, and significant other. Items

are rated on a 7-point rating scale ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*), with scores ranging from 12–84. Social support was assessed exclusively at postdeployment and showed high internal consistency ($\alpha = .94$).

Postdeployment reintegration.   The Post-Deployment Readjustment Inventory (PDRI) is a 36-item measure used to assess service members' adjustment and functioning postdeployment (Katz, Cojucar, Davenport, Pedram, & Lindl, 2010) across six domains: career challenges, health concerns, intimate relationship problems, concerns about deployment, social difficulties, and PTSD symptoms. The PTSD symptoms subscale (seven items) was removed from the current analyses due to its overlap with the PCL-M. Items are rated on a 5-point rating scale from 1 (*not at all*) to 5 (*extremely*), with scores ranging from 29–145. In the present study at postdeployment, $\alpha = .95$.

Suicidal ideation.   The following item assessing suicidal ideation was taken from the PHQ-9 and was rated from 0 (*not at all*) to 3 (*nearly every day*) on the frequency of occurrence in the last two weeks, "Thoughts that you would be better off dead, or of hurting yourself in some way." Item nine of the PHQ-9 is one of the most widely used brief screening tools for suicidal ideation across VA sites (Dobscha et al., 2013). Responses were dichotomized to create a sensitive measure of suicidal ideation due to the lack of variation in responses ($n = 8$ endorsed suicidal ideation "several days" while $n = 1$ endorsed suicidal ideation "nearly every day") and to enhance statistical power. Airmen who endorsed "not at all" were coded as zero and those who indicated suicidal thoughts occurring "several days" or more in the last two weeks were coded as one.

Prevalence of suicidal ideation increased across the deployment cycle; however, none of the Airmen reporting suicidal ideation at postdeployment ($n = 9$) did so at predeployment ($n = 1$). Additionally, all those endorsing suicidal ideation were male. This postdeployment prevalence of suicidal ideation (5.5%) is slightly higher than the 4-week prevalence of 4.1% found in a large sample of active duty Soldiers at 6 months postdeployment (Mitchell et al., 2012).

Data Analytic Strategy

Bivariate logistic regression analyses were used to evaluate hypothesized linkages between prospective and concurrent predictors with postdeployment suicidal ideation. Predictors were evaluated as continuous variables and transformed into z scores for all the logistic regression analyses. In addition, to better understand the relative strength of significant prospective and concurrent predictors, two post hoc multivariate logistic regression analyses were conducted. The first model assessed significant postdeployment concurrent predictors of suicidal ideation determined through bivariate logistic regression analyses. A second multivariate logistic regression model evaluated the comparative predictive power of prospective predictors with that of concurrent correlates of postdeployment suicidal ideation.

Subsequent relative risk analyses were performed in an effort to enhance clinical utility. Significant predictors of postdeployment suicidal ideation were dichotomized using established, clinically relevant cut scores whenever possible. To enhance sensitivity, measures were dichotomized at a low cut score value to better identify the odds of suicidal ideation when even mild or moderate symptoms were present.

All analyses were conducted using a Fully Conditional Specification multiple imputation method in IBM SPSS (version 22) for handling missing data in an effort to reduce the potential for biased estimates. A total of 10 complete datasets were generated using data from the entire set of service members ($n = 318$) measured at predeployment. The pattern of missing data was considered to be missing at random, i.e., that the missing data depended on observed data but not on unobserved data (Schafer & Graham, 2002). The percentage of missing data at

Table 1

Means and Standard Deviations of Predictors by Suicidal Ideation

Postdeployment suicidal ideation	Total sample N	Predeployment problem drinking M (SD)	Postdeployment depressive symptoms M (SD)	Postdeployment problem drinking M (SD)	Postdeployment PTSD symptoms M (SD)	Postdeployment reintegration challenges M (SD)
Yes	20	11.48 (11.39)	11.12 (5.50)	18.06 (9.22)	44.98 (13.61)	77.59 (22.14)
No	298	5.66 (5.23)	6.24 (4.62)	8.53 (6.05)	34.99 (12.85)	61.00 (19.30)
Total	318	6.01 (5.61)	6.53 (4.82)	9.10 (6.68)	35.56 (13.11)	61.96 (19.87)

Note. M = mean; SD = standard deviation; PTSD = posttraumatic stress disorder.

postdeployment was 48.4% ($n = 154$). The results presented below reflect estimates from pooled results across all imputed datasets.[1]

Results

Changes in levels of symptomatology from pre- to postdeployment have been reported elsewhere (Cigrang et al., 2014) and are highlighted here for reference. At predeployment, less than 1% of participants scored in the high range of PTSD (PCL-M $\geq$ 50); by contrast, 21% of PCL-M scores were in the high range at postdeployment. Similarly, there were no participants in the high range of depression at predeployment (PHQ-9 $\geq$ 15), but 9% in the high range at postdeployment. A total of 7% scored in the high range of problem drinking (AUDIT $\geq$ 16) at predeployment, and this increased to 16% at postdeployment. For partnered participants, 25% reported a distressed relationship at predeployment (MSI-B $\geq$ 4), whereas, at postdeployment, 57% reported that relationship as distressed, dissolving, or already dissolved.

Binary logistic regression analyses were used to evaluate the relation between prospective and concurrent predictors of interest and suicidal ideation. Suicidal ideation at predeployment was not included as a criterion variable due to its extremely low endorsement ($n = 1$).[2] Means and standard deviations of significant predictors as they relate to the endorsement of suicidal ideation are presented in Table 1. Additionally, a summary of significant univariate standardized results is presented in Table 2.

Univariate Logistic Regression

Problem drinking was the only predictor that served as both a prospective and concurrent risk factor of postdeployment suicidal ideation. Problem drinking endorsed at predeployment was a significant predictor of postdeployment suicidal ideation, B = .77, Wald = 15.38, $p < .01$, exp(B) = 2.15. Additionally, depressive symptoms and problem drinking served as strong concurrent predictors of postdeployment suicidal ideation, B = .86, Wald = 15.14, $p < .01$, exp(B) = 2.37 and B = 1.21, Wald = 22.95, $p < .01$, exp(B) = 3.37, respectively.

Posttraumatic stress symptoms were concurrently related to suicidal ideation at postdeployment, B = .67, Wald = 9.22, $p < .05$, exp(B) = 1.95, but were not a significant prospective predictor. The combat experiences scale, as a whole, did not predict suicidal ideation; however,

[1]An additional parallel set of analyses was conducted based on the subset of 164 Airmen whose responses at pre- and postdeployment could be matched. The overall pattern and statistical significance of results for this subset of participants was virtually identical to findings from the entire set of service members ($n = 318$) reflecting pooled estimates across the 10 imputed datasets.

[2]The imputed prevalence rate of suicidal ideation at postdeployment, reflecting the pooled estimate across all imputed datasets, was 6.3% (20 Airmen) compared to the observed prevalence rate of 5.5% for the 164 Airmen whose pre- and postdeployment responses could be matched.

Table 2

Univariate Predictors of Postdeployment Suicidal Ideation

Predictor	Postdeployment suicidal ideation (yes/no)		
	B (*SE*)	Wald	Exp(B)
Predeployment predictors			
Depressive symptoms	0.30 (0.27)	3.03	1.35
Problem drinking	0.77 (0.25)**	15.38	2.15
Posttraumatic stress symptoms	0.29 (0.27)	3.83	1.34
Postdeployment predictors			
Depressive symptoms	0.86 (0.31)**	15.14	2.37
Problem drinking	1.21 (0.35)**	22.95	3.37
Posttraumatic stress symptoms	0.67 (0.30)*	9.22	1.95
Combat experiences	0.03 (0.07)	1.11	1.03
Relationship distress	1.62 (1.07)	2.30	5.03
Social support	−0.01 (0.02)	0.88	1.00
Postdeployment reintegration challenges	0.69 (0.28)*	11.00	1.99

Note. SE = standard error. The Wald statistic is a chi-square value of significance. Exp(B) represents the odds ratio associated with one unit change in the predictor.
*$p < .05$. **$p \leq .01$.

specific combat experiences served as concurrent indicators of suicidal ideation. Postdeployment endorsement of "Needing to police or manage civilians in chaotic or unpredictable conditions" was associated concurrently with postdeployment suicidal ideation ($\chi^2 = 5.33$, $p < .05$). The item "Seeing children or mothers who were victims of war" was marginally associated with suicidal ideation ($\chi^2 = 3.39$, $p = .07$)

Psychosocial factors such as relationship distress for partnered Airmen ($n = 92$) and social support for the sample as a whole did not significantly predict suicidal ideation. However, postdeployment reintegration challenges were significantly related to postdeployment suicidal ideation, B = .69, Wald = 11.00, $p < .05$, exp(B) = 1.99.

Relative risk estimates. The relative risk estimate can be thought of as the effect size of the association between two conditions (condition A and condition B). Thus, the relative risk reflects the proportion of individuals with condition A (e.g., depressive symptoms) who experience postdeployment suicidal ideation divided by the proportion of individuals without condition A who experience postdeployment suicidal ideation. To enhance clinical utility, relative risk estimate calculations were conducted by dichotomizing significant predictors of postdeployment suicidal ideation using established, clinically relevant cut scores whenever possible. To enhance sensitivity, measures were dichotomized at a low cut score value to better identify the odds of suicidal ideation when even mild or moderate symptoms were present. Results of relative risk analyses are summarized in Table 3.

Concurrent postdeployment depressive symptoms were dichotomized using the previously established cut score of 10, which identifies mild to moderate depressive symptoms (Kroenke, Spitzer, & Williams, 2001). There was a significant association between depressive symptoms and suicidal ideation at postdeployment ($\chi^2 = 7.09$, $p < .05$). Airmen who endorsed at least mild symptoms of depression postdeployment were 2.93 times more likely to report suicidal ideation than those who endorsed lower levels of depressive symptoms.

Postdeployment problem drinking was dichotomized at a cut score of 8, which indicates at least a moderate level of risky drinking (the lowest established elevation of risk). Moderate problematic drinking postdeployment and suicidal ideation were significantly related ($\chi^2 = 9.01$, $p < .01$). This was also true for predeployment problem drinking, dichotomized in the same manner ($\chi^2 = 6.75$, $p = .05$). Airmen who endorsed at least moderate levels of postdeployment problematic drinking were 7.00 times more likely to experience suicidal ideation than those

Table 3
Relative Risk Analyses With Postdeployment Suicidal Ideation

Postdeployment suicidal ideation	Postdeployment depressive symptoms		Postdeployment problem drinking		Postdeployment PTSD symptoms		Postdeployment reintegration difficulties		Predeployment problem drinking		Postdeployment problem drinking when even mild depressive symptoms (PHQ-9 ≥ 5) are present	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Yes	10	10	18	2	7	13	5	15	13	7	17	1
No	71	227	162	136	37	261	24	274	106	192	107	68
RR estimate	2.93		7.00		3.35		3.32		3.11		9.46	

Note. PHQ = Patient Health Questionnaire; RR = relative risk; PTSD = posttraumatic stress disorder. RR is calculated by dividing the proportion of individuals with condition A (e.g., depressive symptoms) who experience postdeployment suicidal ideation divided by the proportion of individuals without condition A who experience postdeployment suicidal ideation.

who endorsed lower levels of problematic drinking. Airmen with at least moderate levels of problematic drinking predeployment were 3.11 times more likely to report postdeployment suicidal ideation.

Posttraumatic stress symptoms reported at postdeployment were dichotomized using a cut score of 50, which is a previously established threshold cutoff for screening postcombat trauma reactions (Weathers et al., 1993). There was a significant association between elevated postdeployment posttraumatic stress symptoms and suicidal ideation ($\chi^2 = 8.50$, $p < .05$), such that Airmen who endorsed at least moderate levels of posttraumatic stress symptoms were 3.35 times more likely to report suicidal ideation than those who endorsed lower levels of posttraumatic stress symptoms.

Finally, postdeployment reintegration challenges were dichotomized into those Airmen who endorsed (on average) at least "somewhat" to all 29 items on the PDRI, yielding a cut score of 87 indicating at least a moderate level of reintegration challenges. Postdeployment reintegration challenges and suicidal ideation were significantly related ($\chi^2 = 9.03$, $p < .05$). Airmen who endorsed at least moderate levels of reintegration challenges were 3.32 times more likely to experience suicidal ideation than those at lower levels.

Multivariate Logistic Regression

Although univariate analyses identified important individual prospective and concurrent predictors of suicidal ideation, clinicians often confront a client with comorbid symptoms to be considered. To determine the relative effect of predictors of suicidal ideation, two multivariate logistic regression models were evaluated. The first model was designed to assess significant postdeployment concurrent predictors of suicidal ideation and included four postdeployment predictors: depressive symptoms, problem drinking, posttraumatic stress symptoms, and postdeployment reintegration challenges. Proposed predictors were entered in a three-step hierarchical regression model. Predeployment depressive symptoms, problem drinking, and posttraumatic stress symptoms were added into the model first to control for predeployment mental health functioning. Only predeployment problem drinking was a significant predictor of postdeployment suicidal ideation at this step, B = .78, Wald = 13.02, $p < .01$, exp(B) = 2.18 (see Table 4).

Postdeployment depressive symptoms and problem drinking were entered into the model second due to their relevance in prior literature and their strong relation to suicidal ideation in univariate analyses. Both depressive symptoms and problem drinking served as independent predictors of postdeployment suicidal ideation, B = .91, Wald = 8.09, $p = .06$, exp(B) = 2.47 and B = .88, Wald = 9.26, $p < .05$, exp(B) = 2.41, respectively, although depressive symptoms did not reach traditional statistical significance. Posttraumatic stress symptoms and reintegration challenges were entered simultaneously into the third step of this concurrent multivariate model; however, neither predictor was related to postdeployment suicidal ideation above and beyond the effect of depressive symptoms and problem drinking.

A second multivariate logistic regression model evaluated the comparative predictive power of predeployment problem drinking with postdeployment depressive symptoms and problem drinking–the one significant prospective predictor with the two significant concurrent predictors of postdeployment suicidal ideation. All three predictors were entered into the model simultaneously to allow for this comparative analysis. All three predictors reached or approached significance when placed in the model simultaneously. Both predeployment problem drinking and postdeployment depressive symptoms approached statistical significance ($p = .05$) as predictors of postdeployment suicidal ideation, B = .62, Wald = 6.48, exp(B) = 1.85 and B = .91, Wald = 8.60, exp(B) = 2.48, respectively. Postdeployment problem drinking remained a significant predictor of postdeployment suicidal ideation after controlling for predeployment problem drinking and depressive symptoms, B = .85, Wald = 9.69, $p < .05$, exp(B) = 2.34.

Relative risk estimates. Based on multivariate logistic regression results, a final concurrent compound relative risk ratio analysis was conducted evaluating postdeployment problem drinking and depressive symptoms. Results demonstrated that in the absence of depressive symptoms or problematic drinking the risk of suicidal ideation was very low (zero participants in

Table 4

Multivariate Predictors of Postdeployment Suicidal Ideation

Predictor	Postdeployment suicidal ideation (yes/no)		
	B (*SE*)	Wald	Exp(B)
Model 1 (concurrent predictors controlling for prospective predictors)			
Step 1			
Predeployment depressive symptoms	0.26 (0.39)	1.66	1.30
Predeployment posttraumatic stress symptoms	−0.14 (0.45)	0.97	0.87
Predeployment problem drinking	0.78** (0.25)	13.02	2.18
Step 2			
Postdeployment depressive symptoms	0.91[a] (0.46)	8.09	2.47
Postdeployment problem drinking	0.88* (0.36)	9.26	2.41
Step 3			
Postdeployment posttraumatic stress symptoms	−0.51 (0.75)	1.92	0.60
Postdeployment reintegration challenges	0.30 (0.65)	1.45	1.35
Model 2 (significant prospective and concurrent predictors combined)			
Predeployment problem drinking	0.62 (0.32)[b]	6.48	1.85
Postdeployment depressive symptoms	0.91 (0.45)[b]	8.60	2.48
Postdeployment problem drinking	0.85 (0.38)*	9.69	2.34

Note. SE = standard error. The Wald statistic is a chi-square value of significance. Exp(B) represents the odds ratio associated with one unit change in the predictor.
[a]$p = .06$.
[b]$p = .05$.
*$p < .05$. **$p < .01$.

this sample). If depressive symptoms were present but there was a low endorsement of problem drinking then the risk of suicidal ideation also remained very low (one Airman in this sample). However, among Airmen with even mild depressive symptoms (dichotomized at a cut score of 5), there was a significant association between moderate problematic drinking and post-deployment suicidal ideation ($\chi^2 = 7.57$, $p < .05$). That is, for those Airmen with depressive symptoms, problematic drinking increased the probability of suicidal ideation by 9.46 times greater than those who experienced depressive symptoms but with lower levels of problematic drinking.

Discussion

This prospective study is the first to examine suicidal ideation in a sample of service members before and after a 12-month deployment to Iraq. When examined individually, elevated depressive and PTSD symptoms were significant concurrent predictors of suicidal ideation in the postdeployment period. Problem drinking before and after return from deployment were both significant predictors of postdeployment suicidal ideation in the univariate analyses. The relative risk of postdeployment suicidal ideation was nearly seven times higher for Airmen who reported concurrent problem drinking and three times higher for predeployment problem drinking when compared to those who did not.

Airmen's cumulative exposure to potentially stressful deployment experiences was unrelated to suicidal ideation after return from deployment. Two individual items from the 22–item combat experiences scale differentiated Airmen who endorsed suicidal ideation from those who did not, though one was only marginally significant. Common content of the two items appears to be exposure to and responsibility for at-risk civilians in a threatening and chaotic environment. This finding shares some similarity to case reports of deployment experiences involving harm to civilians that have led service members to seek help (Blount, Cigrang, Foa, Ford, & Peterson, 2014; Cigrang, Peterson, & Schobitz, 2005).

Given that Airmen in the present study were military police tasked to help build an Iraqi police force, harm to civilians may have been more salient a stressor than other possible experiences. Because separate analyses of individual items comprising the Combat Experiences Scale raise the risk of Type I error, these results should be considered preliminary. Overall, the present results are consistent with other similar studies of deployed Airmen (Bryan, McNaughton-Cassill, & Osman, 2013) that failed to find a significant association between total combat exposure and suicide risk.

Psychosocial factors showed a mixed association with suicidal ideation. Neither the levels of intimate partner relationship distress (for partnered Airmen) nor perceived social support was associated with suicidal ideation. Bryan and Hernandez (2013) also found that perceived social support did not differentiate suicidal from nonsuicidal participants in a study of nondeployed Airmen. However, these findings are inconsistent with the frequent co-occurrence of a failed spousal or other intimate relationship with completed suicide and suicide attempts in retrospective studies (Bush et al., 2013). In contrast, the level of overall reintegration challenges was a significant concurrent predictor of suicidal ideation. The odds of suicidal ideation were three times higher for Airmen who reported reintegration challenges compared to those who did not. The majority of items on the PDRI dealing with interpersonal challenges have to do with not fitting in and feeling disconnected from others, e.g., "feeling alienated or alone," "I've changed or others have changed," or "my partner/family does not understand me."

When the significant concurrent predictors of postdeployment suicidal ideation were analyzed together (depressive symptoms, problem drinking, posttraumatic stress symptoms, and postdeployment reintegration challenges), only depressive symptoms and problem drinking retained significance after controlling for predeployment mental health. Predeployment problem drinking predicted postdeployment suicidal ideation in the univariate analyses, and remained marginally significant even after controlling for levels of postdeployment alcohol use and depression. Problem drinking figured prominently in the final odds relative risk analysis of postdeployment suicidal ideation. Postdeployment depressive symptoms in the absence of problem drinking did not substantially increase the odds of suicidal ideation, but the co-occurrence of problem drinking and depression was associated with greater than a ninefold increased risk.

Hence, problem drinking appears to have played an important role in predicting and relating to the occurrence of suicidal ideation after deployment in this sample of Airmen. As a concurrent risk factor, excessive alcohol use may "lubricate the gears" (Ali et al., 2013) to increase suicide risk via greater impulsiveness, impaired problem solving, and depressant effects. Our results also suggest that a pattern of problem drinking before deployment imparts a vulnerability for experiencing suicidal ideation in the context of postdeployment depressive symptoms. Airmen who rely excessively on alcohol for managing their mood before deployment may find themselves less able to cope with a postdeployment depressive episode, increase their alcohol consumption further, and succumb to greater hopelessness. This pathway is consistent with Millennium Cohort study findings that alcohol-related problems were a prospective risk factor for new-onset depression (Wells et al., 2010) and suicide death (LeardMann et al., 2013).

What are the implications of these findings for future suicide prevention efforts? A credible argument can be made for invigorating alcohol abuse reduction efforts in primary care as an important component of military suicide prevention. Approximately half of the service members who complete or attempt suicide are seen by a healthcare provider within 30 days before the event (Bush et al., 2013). Brief alcohol interventions designed for primary care are effective in reducing alcohol consumption (Berholet, Daeppen, Wietlisbach, Fleming, & Burnand, 2005; U.S. Preventive Services Task Force, 2004), allowing greater reach to the population at risk. Military primary care clinics screen for alcohol-related problems as part of the deployment-related health screening process (DoD/VA Post-Deployment Health Clinical Practice Guideline, 2012).

Finally, the military healthcare system now routinely includes behavioral health providers as fully integrated members of primary care teams (Bryan & Corso, 2011; Cigrang et al., 2011). These key elements undoubtedly contributed to the Institute of Medicine's conclusion in their review of substance abuse care for the military that "primary care is the single greatest missed

opportunity" for early identification and brief intervention for misuse of alcohol (Institute of Medicine [IOM], 2013, p. 8).

Screening and proactive intervention for service members at risk for self-harm presuppose a willingness to self-identify and disclose mental health information. Service members understand that endorsing problems on medical screenings that are not anonymous can lead to additional screening forms, interviews by a physician or mental health specialist, and their commander being alerted. Service members who are reluctant or ambivalent toward help seeking often opt out of the process by denying current symptoms or problems. Warner and colleagues (Warner et al., 2011) amply demonstrated this dilemma in a study and found that the postdeployment prevalences of PTSD, depression, and suicidal ideation among Soldiers were three to four times higher when the screening process was anonymous.

In the past several years, there has been a growing consensus in support of offering greater patient confidentiality to military members to help facilitate access to treatment (Engel, 2013; Hoge & Castro, 2012). The IOM report on military substance abuse specifically recommended that "each service branch provide options for confidential treatment of alcohol use disorder" (IOM, 2013, p. 10).

Although the current investigation mitigated several potential limitations through the use of a prospective study design, this study is not without its limitations. Because suicidal ideation is a low incidence phenomenon, the relatively small sample size of the current investigation limited the power and ability to perform complex longitudinal analyses. The nature of the sample did not permit for group comparisons of deployed versus nondeployed personnel. Moreover, the current sample was comprised mostly of men, all Security Forces, who deployed to achieve the same mission. Thus, as a whole, the generalizability of the results may be limited when considering other branches, deployment missions, and female service members. Finally, additional measures including feelings of belongingness or burdensomeness (Bryan & Corso, 2011), unit cohesion (Mitchell et al., 2012), suicide acceptability (Stack & Kposowa, 2008), and historical factors such as past suicidal behaviors (i.e., attempts or gestures) and military entrance waivers (Department of the Army, 2010) would help illuminate results further in future investigations.

Nevertheless, this is one of few prospective studies designed to evaluate risk factors for suicidal ideation across the deployment cycle. Findings clearly identify modifiable prospective indicators (i.e., predeployment problem drinking and depressive symptoms emerging during deployment) as potential targets for early intervention to reduce the likelihood of suicidal ideation, with the intent of ultimately reducing service members' and veterans' suicide attempts or completions. This investigation also illuminates the compound risk of depressive symptoms and moderate problem drinking in predicting suicidal ideation, alerting primary care providers and clinicians alike to the potential dangers of these comorbid conditions.

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